



SERIES
29

MILITARY VEHICLE PRINTS



SERIES TWENTY NINE

Char Somua S-35 (FR)

Sturmgeschuetz IV (L/48) (7.5 cm Stu.K 40) (GE)

Three Ton Special Tractor (Ford) (US)

DETAILED PLAN VIEWS PRESENTED IN 1:76 & 1:48 SCALE 25p



ABOVE: *The Char Somua S-35 was the medium tank of the three French Divisions Légère Mécanique (DLM) at the outbreak of the German attack on France in 1940. At this time it could be considered an excellent tank with good armour, mobility and armament. Unfortunately the DLM were broken up and used for piecemeal defence and only limited local successes were achieved. This overhead photograph gives a clear indication of the layout and shape of the cast hull and turret. (Photo: E. C. P. Armees)*

COVER ILLUSTRATION — Drawn by George Bradford

The Char Somua S-35 on the cover shows the original colour scheme of the vehicle now on display at the Armor Proving Ground, Aberdeen, Maryland. When it is realised that this tank was photographed many times for German recognition manuals, it is even more interesting. Obviously it was held by some German technical section whose only modification was the addition of a German radio set and antenna. In German pictures it appears with the number WH 0204722 hung on wire between the towing eyes. Other French markings not visible in the colour drawing are, number plate painted on front — national tricolour and 904, tricolour roundels on the cupola top and rear of the turret.

BELLONA MILITARY VEHICLE PRINTS — Series Editor : Hilary Louis Doyle

Char Somua S-35

Drawings and historical research by Phil Dyer

Soon after the end of the First World War the headquarters of the Artillerie d'Assaut, as the French Tank Corps was known, was abolished and the responsibility for the design, development, and use of Chars d'assaut (Tanks) was put under control of a branch of the Infantry. The Infantry only required the use of tanks in accompanying Infantry in the attack. For this purpose, armour protection was the prime consideration and any speed above five miles per hour was considered satisfactory. Over the years various Chars de Bataille (Battle Tanks) and Chars Légers (Light Tanks) were developed which fulfilled these requirements but were not suitable for armoured warfare as visualised by a few far sighted people.

During World War I the French Cavalry were equipped with a number of Armoured Cars which were termed Automitrailleuse (Motor machine gun) or Autocanon (Motor cannon). After the war the Cavalry Corps proceeded slowly with mechanisation. In the early 1930s in order to increase cross country mobility for which armoured cars were not satisfactory they started developing their own tanks. In order to overcome the opposition of the Infantry to this encroachment on their monopoly the Cavalry called their tanks Automitrailleuse de Reconnaissance abbreviated to AMR. They differed from the Infantry Chars Légers mainly by being very lightly armoured but with a high top speed.

As the AMRs were only armed with machine guns, heavier armed and armoured vehicles were developed by the Cavalry which were termed Automitrailleuse de Combat abbreviated to AMC. The requirements for a vehicle armed with a 25 mm or 47 mm gun, 40 mm armour, a crew of three, and a range of 125 miles was specified by the cavalry in 1934. A prototype was produced by the Societé d'Outillage Mécanique et d'Usinage d'Artillerie

abbreviated to SOMUA at the Puteaux Arsenal which was designated APX. Tests with this vehicle were very successful, and on acceptance by the Cavalry it received the designation AMC Somua AC-3.

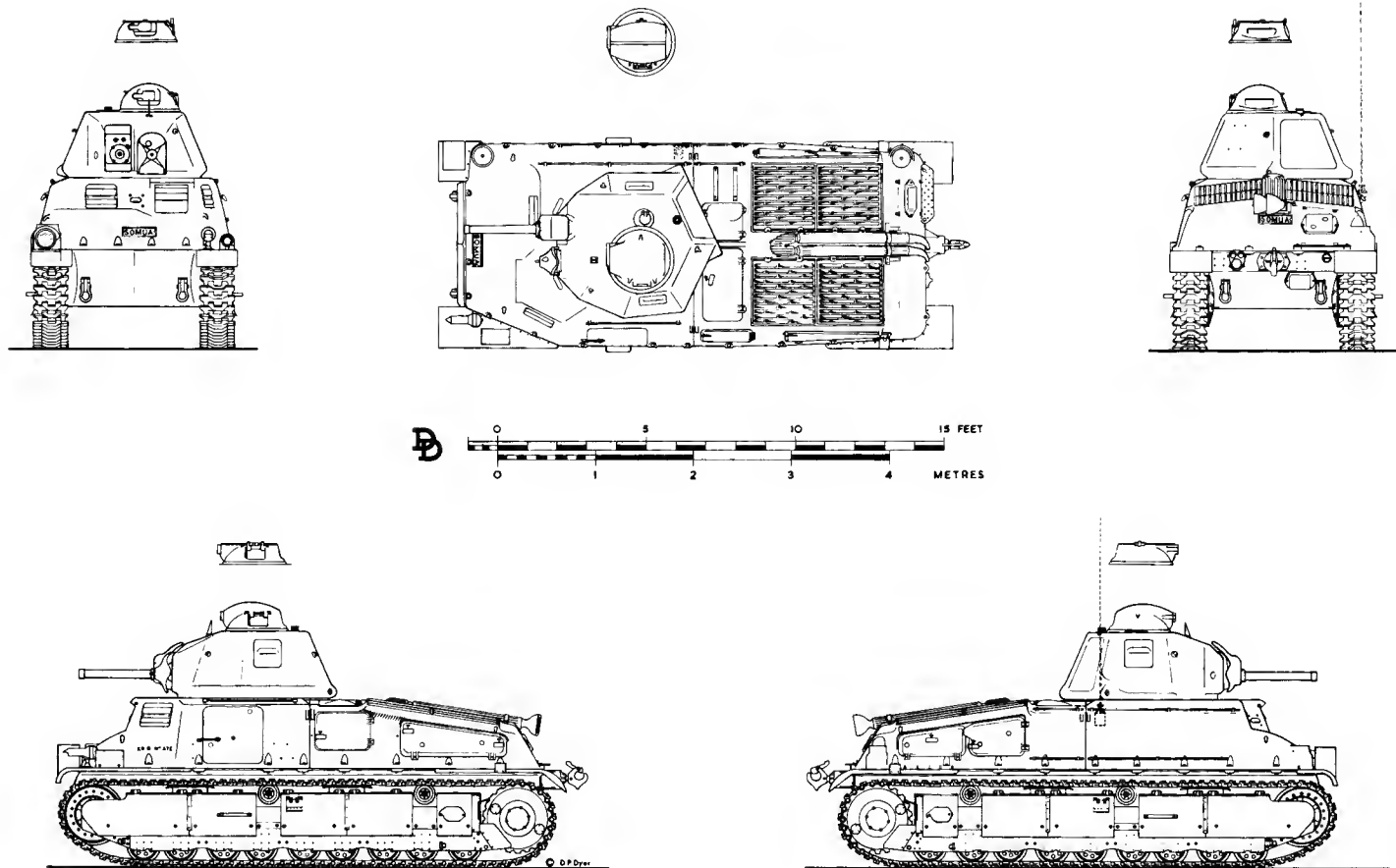
In view of the firepower and armour of this vehicle which was comparable to an 'Infantry' tank, but which had the superior range and speed of a 'Cavalry' tank it was very quickly adopted as the new Medium Tank and re-designated Char S-35 (S for SOMUA, 35 for 1935 being the year of introduction). Production went ahead to help equip the Divisions Légère Mécanique, abbreviated to DLM, (Light Mechanized Division) which were the nearest French equivalent to the German Panzer Divisions although their role was far different.

It was considered at the time, that as well as being the best French tank available, it was superior in many respects to foreign tanks of the period. Cast armour had been pioneered by the French in the manufacture of tanks, and this method of construction was again used on the S-35. Due to this it had smooth contours with sloped faces and the minimum of shot traps. The body was formed from three main castings; fighting compartment and hull, all of which were bolted together. The turret was cast, as was the cupola, gun mantlets and the various hatches, ports and doors. The thickness of this armour varied from 56 mm to 36 mm which was quite considerable when one considers that the German medium tanks of the period only had a maximum 30 mm flat plates.

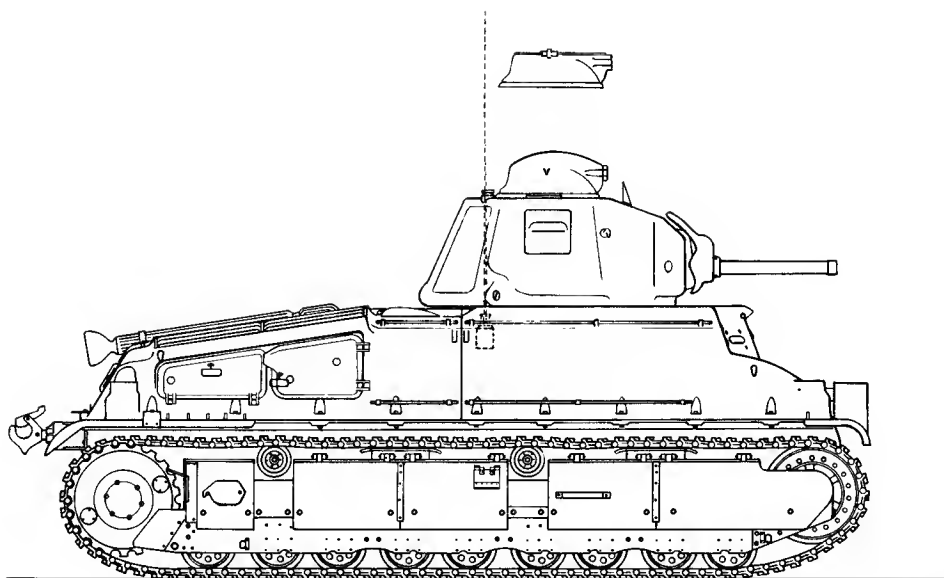
The 47 mm SA-35 gun was at the time of its introduction probably the best anti-tank weapon in any army. The turret had electric traverse which was a very advanced feature, and the regenerative controlled differential steering was years ahead of its time. On top of this it had a very reasonable top speed and a fair range. There were however certain very bad features. The most serious, as with all other French tanks of the period, was the one man turret which was exactly the same as that used on the Char B-1 bis. This meant that one person had to load, lay and fire the guns, do his own observing, command the tank and liaise with other tanks or units. In the thick of battle when all of these jobs had to be done at the same time, something had to suffer, whether it was observation, rate of fire, control or co-operation, any of which would detract from the vehicles efficiency as a fighting machine.

BELOW: *Curious German Infantry examine a knocked out Char Somua S-35. This S-35 was destroyed by shots which penetrated the hull side and the rear of the turret on the left hand side. (Warpics Photo)*





CHAR SOMUA S.35



Technical Specification for CHAR SOMUA S-35

Crew	3	Mechanical Details	
Weight, Combat loaded	44,200 lbs 19.7 Long tons, 22.1 short tons, 20 Tonnes	Engine	Somua V-8 Cylinder 190 HP at 2000 rpm petrol water cooled 5F 1R
Performance		Transmission	Overlapping differential
Speed, Max. Road	23 m.p.h. (37 Km.p.h.)	Steering	Four two wheel bogies on semi-elliptic leaf springs plus coil sprung rear wheel each side
Max. Gradient	40 degrees (65%)	Suspension	
Fording depth	3'-3" (99 cm)		
Trench crossing	7'-8" (234 cm)	Armament	
Step	1'-8" (51 cm)	Main	47 mm tank gun 5A 35 (M.V. 2,805 fps)
Ground pressure	12.1 lbs/sq. ins. (.92 Kg/sq. cm)	Calibre and length in calibres	47 mm (1.84 ins) L/34
Range (internal fuel)		Traverse	360 degrees. Operation: hand and electric
Road	160 miles (257 Km)	Secondary armament	1 x 7.5 mm Model 31 Châtelleraut Machine Gun Co-Axial
Cross country	80 miles (129 Km)		
Power to weight ratio		Stowage	
Gross	9.6 HP/ton	Ammunition, main armament	118 rds
Dimensions		Ammunition, secondary armament	1250 rds
Length overall	17'-11" (546 cm)	Internal fuel capacity	91 Imp. gals. 109 U.S. gals. 413 Litres
Width overall	6'-11" (211 cm)		
Height	8'-10" (269 cm)	Armour	
Ground clearance	1'-4½" (42cm)	Type	Cast steel
Fire height of gun	6'-6" (198 cm)	Hull, nose area	1.4" (36 mm)
Turret ring dia.	4'-0" (122 cm)	Sides	1.6" (41 mm)
Road wheel dia.	11" (28 cm)	Turret	2.2" (56 mm)
		Front	1.8" (46 mm)
		Sides	1.8" (46 mm)
		Rear	1.8" (46 mm)
Trackwork			
Centres	5'-7" (170 cm)		
Length on ground	10'-8" (325 cm)		
Width	1'-2" (36 cm)		
Pitch	4" (10 cm)		
Number of links per track	103		
Type	Single Dry Pin Cast Integral Grouser		



ABOVE: *The Char Somua S-35 that is now on display at the Armor Proving Ground, Aberdeen, Maryland, U.S.A. This vehicle though used by, and captured from the Germans, was not modified, except by the fitting of German Radio equipment. A Somua S-35 on display in the R.A.C. Tank Museum, Bovington, England, has been fully modified by the Germans for use with one of their combat units. (Armin L. Sohns Photo)*

As regards observation the commander in the turret was the only person with the means of observing to the rear or sides. On each side of the turret was an Episcopes. The cupola had a vision port to the front which could be closed with a pivoted shutter, and one to the left side with a letter box flap cover. At the rear was a vision slot. The cupola was rotateable. On the hull itself the driver had two episcopes, one in front of him which was fitted into his visor which could be opened, one angled to his left, and a small vision slot angled right. The wireless operator just had one episcopes directly in front of him. All of the vision slots were fitted with replaceable bullet proof vision blocks.

Whilst the 47 mm SA-35 and the 7.5 mm Châtellerault machine gun both had separate mantlets they were co-axially mounted. The single telescopic sight aperture for both being in the machine gun mantlet. To the right of the cupola on top of the turret was a hinged signal port which could be used for signal flags or for firing a signal pistol. The socket at the centre rear of the turret top above the flush fitting emergency door was for holding signal flags which could be inserted via the emergency door with the minimum of exposure. Normal entrance for all crew members to the interior was through the flush fitting door on the left hand side of the fighting compartment.

Engine, gearbox and final drive were all contained in the rear part of the tank and were all contained in the rear part of the tank and were separated from the fighting compartment by a bulkhead. It appears that the engine was not very accessible, and for major repairs would seem that the rear upper half of the hull would have to be unbolted and lifted off.

From the very beginning provision was made for wireless equipment, and aerial mountings were provided at the corners of the hull on the right hand side.

Approximately 400 S-35s are stated to have been built, of which 261 were divided equally amongst the 1st, 2nd and 3rd DLM (87 each). Approximately 50 were with the 6th DLC and one group was allocated to the newly-formed 4th DCR (Divisions Currassée) under the command of General de Gaulle. The remainder were either new vehicles from the factory which didn't have a chance of being allocated, or were with training units. The 6th DLC was stationed in Tunisia at the outbreak of hostilities with Germany. It is interesting to note that the DCR were normally equipped with Char B and Hotchkiss H35 or H39.

The 1st DLM was with the French 7th Army positioned in the North of Belgium and into Holland. The 2nd and 3rd DLM were in the middle of Belgium with the French 1st Army. In these positions they fought against Heeresgruppe B consisting of the German 6th and 18th Armies of which the 39 Corps had the 9th Panzer and the 6th Corps had the 3rd and 4th Panzer. The 4th DCR, under de Gaulle, was at least successful in harassing the flanks of the 1st Panzer Division at Montcornet from the 16th to the 20th of May, 1940. The 1st Panzer Division was under the command of Guderian at this time and in his memoirs, Guderian shows that these valiant attacks were of little worry to him. The results of the battles are a matter of history and the S-35s that weren't destroyed were captured.

A number of the captured S-35 were used by the Italians for the defence of Sardinia and Corsica. These were shipped out in January 1942, but as the expected invasion of these Islands never took place they were not used by the Italians in action against the Allies.

Due to heavy tank losses by the Germans in 1943 on the Russian Front an order was issued by the German High Command severely restricting the use of new German tanks for training, or for fighting partisans in occupied territories. Captured French vehicles in storage, of which there were large numbers, were, therefore, pressed into service for these duties. Captured S-35 were given the designation Pz.Kpfw 35S 739(f) and a number of them were issued to some of the regular German Panzer Divisions. For this purpose they were modified mainly by the fitting of German wireless equipment. The standard German two metre aerial was fitted to a bracket welded to the top of the upper hull half way along on the right hand side (shown dotted on the drawings). A further modification was the machining off of the top of the cupola and the fitting of twin opening hatches (inset drawings). S-35 so modified appear to have been used by the Germans as Platoon Leaders' vehicles for the units of Hotchkiss H-35 and H-39 which had been similarly 'adapted'.

The example exhibited at R.A.C. Tank Museum, Bovington, England is of a German modified vehicle. There is an S-35 at the United States Army Proving Ground in Maryland. This S-35, though taken from the Germans still has its domed cupola and was therefore not a vehicle used by a regular German Armoured Unit. Such vehicles that were unmodified were used for 'police' duties and were known as 'Polizei Panzerkampfwagen'. The only other example still known to be in existence will be exhibited at the French Tank Museum which is in process of being created.

BELOW: A "Panzerkampfwagen 35S 739(f)" — a Char Somua S-35 fully modified for German use. In this photograph we see the Somua S-35 being used as the platoon leaders vehicle for a *Panzerschule* (armour school) unit equipped with the French Hotchkiss H 39/40 light tanks.





ABOVE: *Field Marshall Albert Kesselring of the Luftwaffe, German Field Commander for Italy, observing fire from a Sturmgeschuetz IV unit in Italy during 1944. The officers accompanying the Field Marshall are from Army and Luftwaffe Armoured units. The Luftwaffe personnel are probably from the Fallschirm-Panzerdivision 'Hermann Goering'.*

STURMGESCHUETZ IV (L/48) (7.5 cm Stu.K 40) — Sd Kfz 163

Drawings by Hilary Louis Doyle. Historical Research by Hilary Louis Doyle, Walter J. Spielberger and Armin L. Sohns.

As early as 9th March 1943, Guderian proposed to Hitler that some of the decimated tank battalions in the Panzer Divisions be equipped with Sturmgeschuetz, until such time as the tank production had been raised sufficiently. This suggestion was made in the light of great increases that had been achieved in Sturmgeschuetz production when the PzKpfw III was eliminated early in 1943. In fact, production was to be 220 guns in June, over double the figure produced six months earlier.

During 1943 there were several unsuccessful attempts made to have the production of the PzKpfw IV abandoned so that the facilities would be available for the Panther and Tiger and also for the new series of Panzerjaeger IV (Bellona Print Series 30) which were being designed to carry the same 7.5 cm L/70 cannon as the Panther. Fortunately, PzKpfw IV production was continually increased and separate new facilities were prepared by Vomag AG in Plauen for the production of the Panzerjaeger IV vehicles. In order to fill commitments to the antitank defence of Infantry, the Sturmgeschuetz III production target was raised to 350 units per month for the latter part of 1943 and a production of 500 units per month was demanded from January 1944, although this latter figure was to include the new Panzerjaeger IV vehicles.

At the beginning of November 1943, at a discussion in Hitler's Headquarters, the decision was made to bolster the lagging production of the Sturmgeschuetz III by utilising the chassis of the PzKpfw IV. PzKpfw IV suppliers still had the capability to raise production faster than those ones committed to the Sturmgeschuetz III. At this time Hitler pointed out that the Sturmgeschuetz with a PzKpfw IV chassis should be used to re-equip Panzer

Divisions where ever necessary, instead of the Sturmgeschuetz III, thus simplifying the supply of spares. This attitude is clear in the Fuehrer direction No. 51 dated 3rd November, 1943 "Manning of the Atlantic Coast" in which Hitler ordered that Panzer Divisions in the West be reinforced with the proposed Sturmgeschuetz IV. Hitler demanded to see the prototype of this new Sturmgeschuetz IV at a demonstration that was to be held on the 16th December 1943.

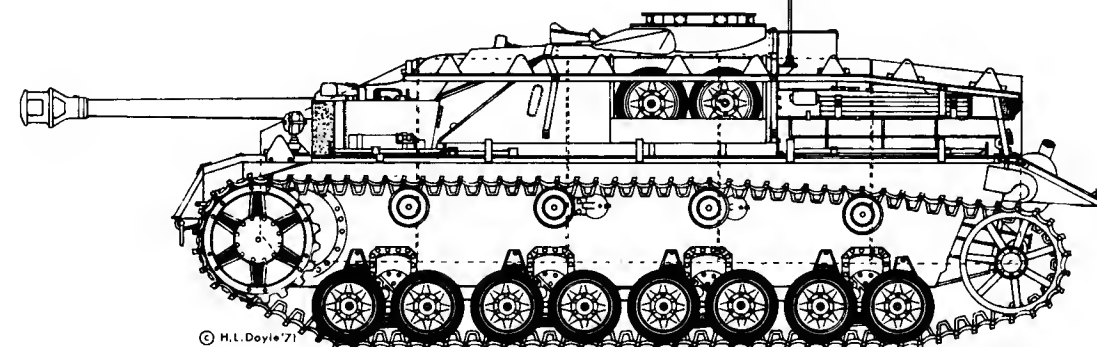
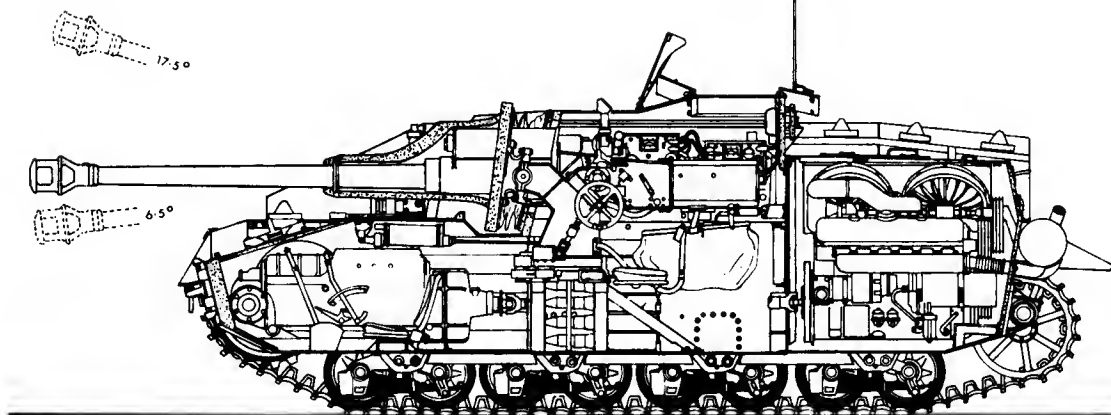
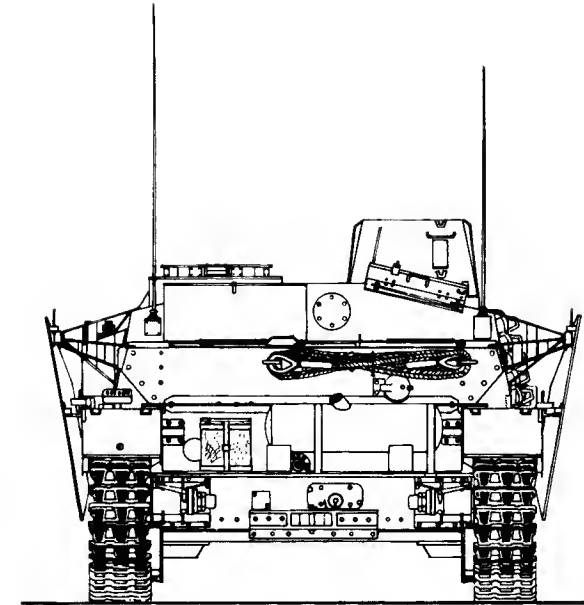
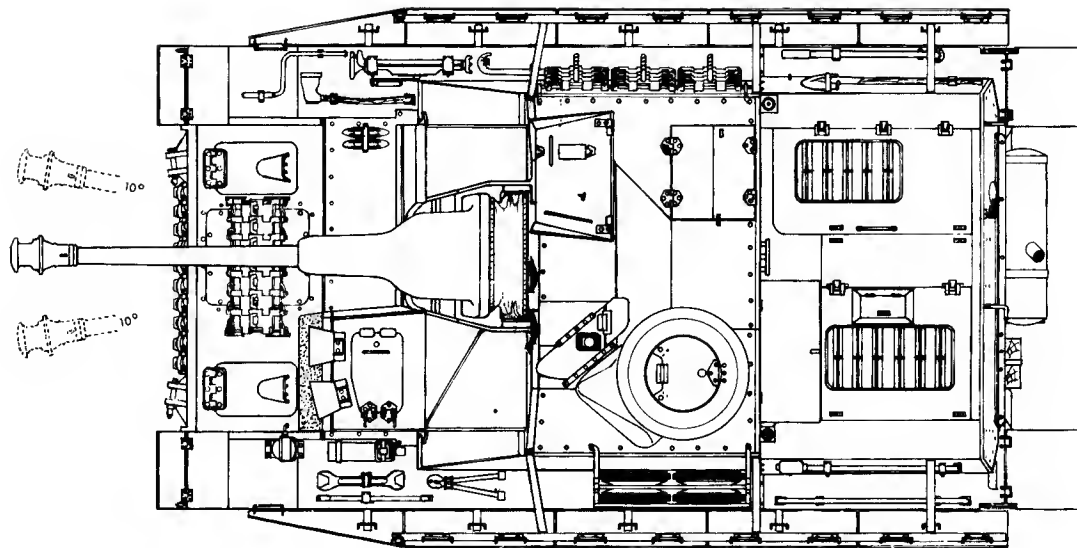
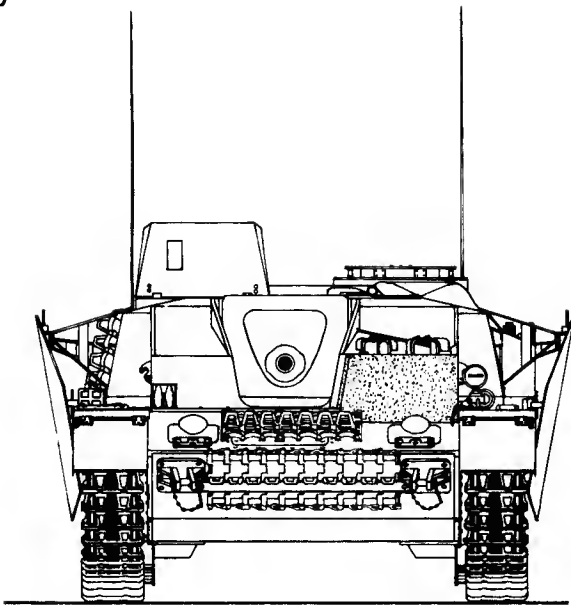
The prototype was designed hurriedly under the designation "Geraet Nr 820". Fortunately, no major modifications had to be incorporated and the Sturmgeschuetz IV was duly presented to Hitler on the 16th December 1943 along with the new Panzerjaeger IV. After this demonstration both vehicles were released for immediate mass production.

The Sturmgeschuetz IV was assembled by Krupp-Gruson AG, of Madgeburg-Buckau. The hulls were supplied by Hoehler of Kapfenberg, Eisenwerke Oberdonau of Linz, Krupp of Essen and EHW of Bochum. The Brandenburgischen Eisenwerke produced the modified Sturmgeschuetz III superstructures. The 7.5 cm Sturmkanone 40 (L/48) was supplied by both Wimag of Berlin and Skoda of Pilsen (Prague).

The old PzKpfw III or ZW chassis, used for the Sturmgeschuetz III, had a shorter hull with higher sides than that of the PzKpfw IV. In fact, the PzKpfw IV was approximately 46 cm too long and 8 cm too low for the Stu.G III superstructure. A flat armour deck plate and a special driver's compartment were, therefore, fabricated and thus the superstructure was extended by the necessary length. 8 cm strips of armour were welded to the bottom of the pannier sides to bring it into line with the PzKpfw IV hull. The new driver's compartment was equipped with two periscopes in the roof and an exit hatch was provided, making escape easier than in the regular Stu.G III.

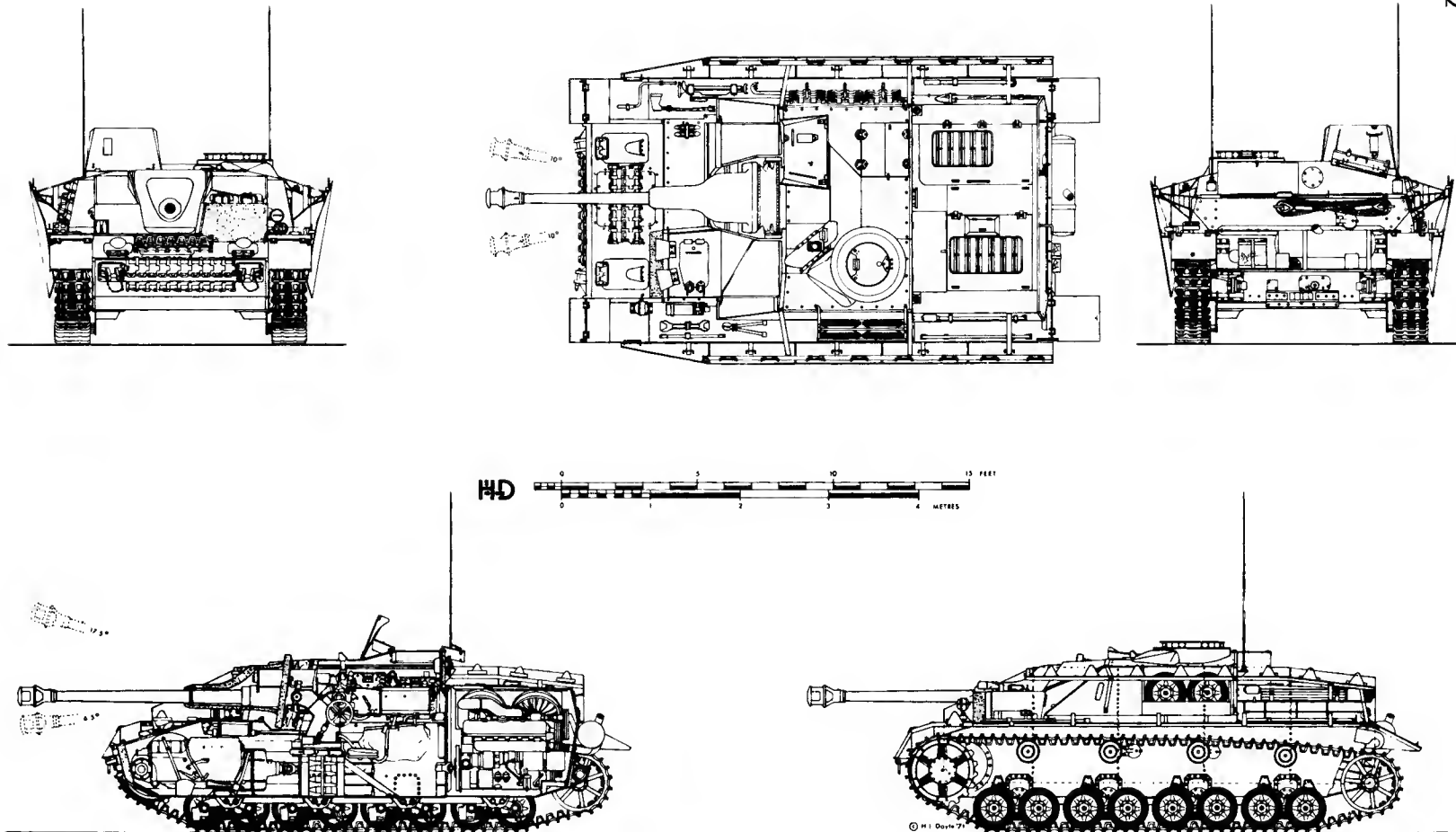
BELOW: A captured Sturmgeschuetz IV is compared to the Sturmgeschuetz III, in the background, at a special demonstration for officers of Allied combat units in Italy during 1944. Other vehicles seen in this photograph are: Marder II (Bellona Series 21). 7.5 cm Pak 40 auf Sfl 38(t) Ausf. H, the Italian Semoventi M 42 (DA75/34) and Semoventi M41 (DA75/18). (IWM Photo)





STURMGESCHÜTZ IV (L/48) (7.5cm StuK 40)

DRAWN BY HILARY LOUIS DOYLE



STURMGESCHÜTZ IV (L/48) (7.5cm StuK 40)

DRAWN BY HILARY LOUIS DOYLE

Technical Specification for Sturmgeschuetz IV (L/48) (7.5 cm Stu.K 40)

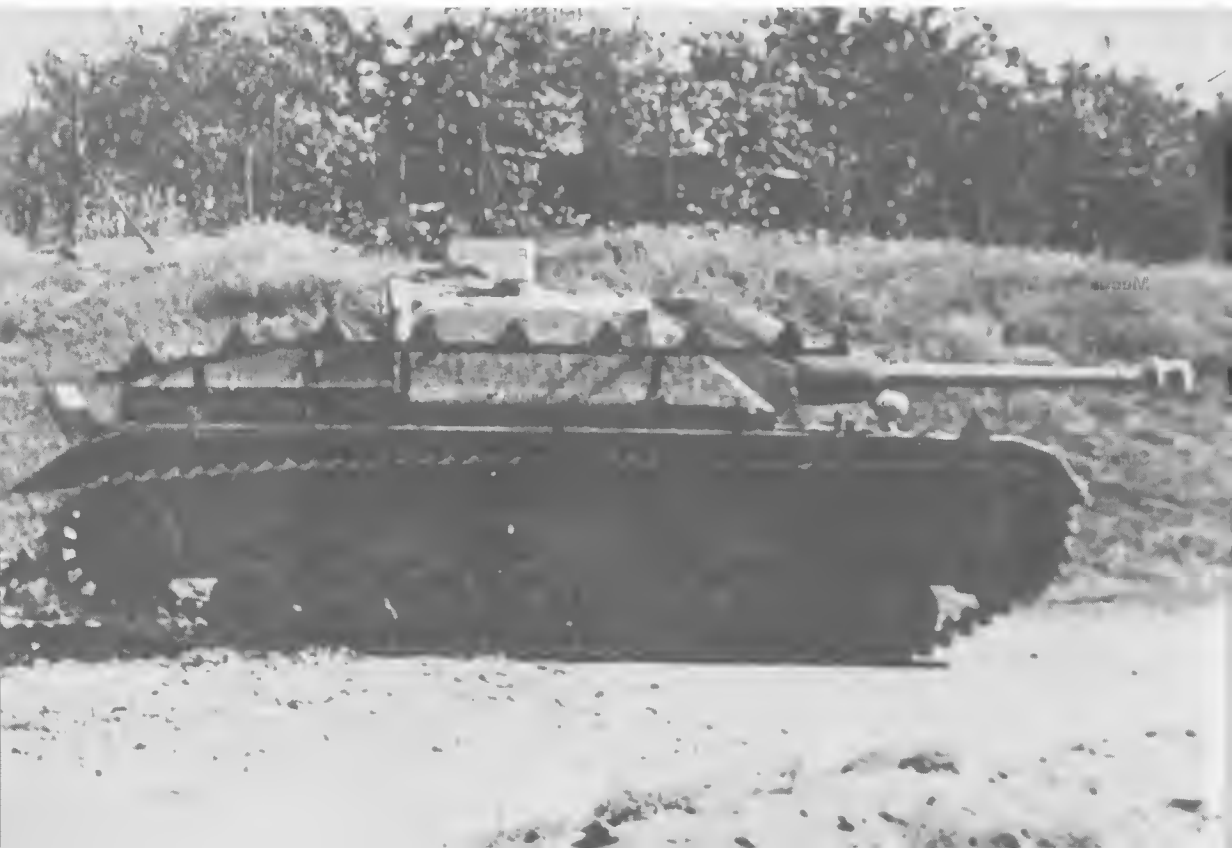
Crew	4	Armament	
Weight, Combat loaded	50,624 lbs, 22.6 Long tons 25.31 Short tons, 23 Tonnes	Main	1 x 7.5 cm Stu.K 40
		Calibre and length in	
		calibres	75 mm (2.953 ins) L/48
		Traverse	10 degrees left, 10 degrees right. Operation: hand, plus 17.5 degrees, minus 6.5 degrees
Performance		Elevation	
Speed, Max. Road	24 mph (38 Kmph)	Muzzle velocity	2460 ft. sec (750 m. sec) for Pzgr 39
Cross country	15 mph (24 Kmph)		1805 ft. sec (550 m. sec) for Spgr 34
Max. Gradient	30 degrees (57.5%)		3050 ft. sec (930 m. sec) for Pzgr 40
Fording depth	4'-0" (120 cm)	Projectile weight	Pzgr 39 — 15.00 lbs (6.80 Kgs) Pzgr 40 — 7.08 lbs (3.20 Kgs) Spgr 34 — 12.68 lbs (5.74 Kgs)
Trench crossing	7'-2½" (220 cm)	Secondary armament	1 x 7.92 mm MG 34 1 x 9 mm MP 38
Step	1'-11¼" (60 cm)		
Min. turning circle	(5.92 metres)		
Ground pressure	(0.8 Kg/sq.cm)		
Range (internal fuel)			
Road	131 miles (210 Km)		
Cross country	81 miles (130 Km)		
Power to weight ratio	(Net) 10.6 Metric HP/ton		
Dimensions		Stowage	
Length overall	22'-7½" (690 cm)	Ammunition, main	
Length	19'-6" (595 cm)	armament	63 rds
Width inc. Schuetzen	12'-0" (340 cm)	Internal fuel capacity	95 Imp. gals, 114 U.S. gals, 430 Litres
Width	9'-10" (295 cm)		
Height	7'-0¼" (214 cm)	Armour	
Ground clearance	1'-3¼" (40 cm)	Type	Homogenous rolled steel plate
Fire height of gun	5'-0" (153 cm)	Hull	
Road wheel dia (overall)	1'-6¼" (46.5 cm)	Nose upper	3.346" (85 mm) at 76 degrees
		Nose lower	1.181" (30 mm) at 26 degrees
		Glasis plate	0.787" (20 mm) at 17 degrees
		Drivers plate	3.397" (100 mm) at 90 degrees
Trackwork		Sides	1.181" (30 mm) at 90 degrees
Centres	8'-1" (245 cm)	Rear, lower	0.787" (20 mm) at 80 degrees
Length on ground	11'-6¼" (352 cm)	Rear, upper	0.787" (20 mm) at 79 degrees
Width	1'-3¼" (40 cm)	Engine covers	0.394" (10 mm) at 2 degrees
Pitch	4.75" (12 cm)	Belly	0.394" (10 mm) at 0 degrees
Number of links per		Superstructure	
track	99	Front lower	3.150" (80 mm) at 80 degrees
		Front upper	1.181" (30 mm) at 22 degrees
Mechanical Details		Sides	1.181" (30 mm) at 79 degrees
Engine	1 x Mabach HL 120 TRM V-12 11.88 litre watercooled petrol developing 300 bhp at 3000 rpm.	Rear	1.181" (30 mm) at 90 degrees
		Roof	0.669" (17 mm) at 15 degrees
		Roof	0.433" (11 mm) at 0 degrees
Transmission	ZF SSF 76.6 forward and 1 reverse speeds	Mantel	3.397" (100 mm) cast
Steering	Epicyclic clutch and brake. Mechanically operated.	Cupola	1.181" (30 mm) at 90 degrees
Suspension	4 articulated bogies on each side, sprung on quarter elliptic leaf springs	NOTE:	90 degrees = vertical
		COMMUNICATIONS	
			1 x FU2 Eu a2 and 1 x FU5 SE 10U operating on 33,3 — 27,2 Mhz range 2 to 4 Km.

The superstructure used was from the current production of the Stu.G III Ausf.G thus had an armour basis of 50 mm, which had been raised to 80 mm by the addition of a 30 mm plate bolted on the front vertical surfaces. The so called 'saukopf' cast gun mantlet appears to have been introduced on the Stu.G IV. Certainly no pictorial evidence presently available shows these vehicles with the older welded mantlet common on the Stu.G III. The chassis of the early Stu.G IV was from the PzKpfw IV Ausf.H (9/BW) production series.

Obviously, the Stu.G IV followed, simultaneously, the development of both the Stu.G III through its superstructure, and the PzKpfw IV through its chassis. Before long it appeared with the 80 mm basis superstructure and a PzKpfw IV Ausf.J (10/BW) chassis. This is the type of Stu.G IV represented in our drawing and would have been produced in mid 1944. When the Stu.G III was equipped with the remote controlled MG 34, developed for the Jagdpanzer 'Hetzer', and the Nahverteidigungswaffe (Close-in-defence weapon) the Stu.G IV was likewise improved. Finally, came the Stu.G IV on the late PzKpfw IV Ausf.J chassis which had twin exhaust pipes in place of the single muffler. Again pictorial evidence suggests that most Stu.G IV had additional protection for the front of the drivers compartment provided by a slab of ferro-concrete about 15 cm thick. On some examples extensive use was made of this concrete reinforcement on all the frontal surfaces.

Officially designated 'Sturmgeschuetz IV (L/48) (7.5 cm Stu.K 40)' — Sd Kfz 163, this vehicle was mass produced at the same time as the more modern Panzerjaeger IV series which was equipped with both 7.5 cm L/48 and L/70 guns. Hitler attended a special presentation of all the 'light' assault guns and tank destroyers on his birthday,

BELOW: A rare photograph of a late production Sturmgeschuetz IV. The chassis is of the latest PzKpfw IV Ausf. J type, while the superstructure was equipped with the remote controlled MG 34 mounting, first seen on the Jagdpanzer 'Hetzer', and with the Nahverteidigungswaffe (Close-in defence weapon). (R.A.C. Tank Museum Photo)





ABOVE: *The gun barrel of this Sturmgeschuetz IV was blown off to render it useless, after it had to be abandoned by its crew in France during 1944. While this close up photograph shows details of the extended drivers compartment, the most interesting feature is the very extensive use of concrete to improve protection. Almost all Sturmgeschuetz IV had some additional concrete armour. (R.A. C. Tank Museum Photo)*

20th April 1944, when the following were demonstrated; Stu.G III (L/48), Stu.G IV (L/48), Panzerjaeger IV (L/48) (Pak 39), Panzerjaeger IV (L/70) and Panzerjaeger 38(t) 'Hetzer'. After this demonstration he ordered that all available production priorities be given over to the 'Hetzer' and Panzerjaeger IV (L/70). However, the Stu.G IV appears to have continued in production at least until the end of 1944. Available German production figures do not differentiate between the different types of Sturmgeschuetz. Keeping in mind that the Stu.G IV was a makeshift solution, introduced to augment lagging production of the Stu.G III, it seems from analysis of the figures that about 1000 Stu.G IV may have been built during 1944. British Intelligence sources variously quote figures of 632 and 846 having been built by Krupps. However, confusion exists in the designation to the vehicles referred to, so these figures may be completely incorrect.

Crew strength, as usual with the Sturmgeschuetz, was four men. They had somewhat more room in the fighting compartment, with the driver forward of the normal superstructure. This combined with the fact that the PzKpfw IV suspension did not intrude into the hull, as did the torsion bars of the PzKpfw III chassis, allowed for stowage of an additional 9 rounds of 7.5 cm ammunition which increased the total to 63 rounds. Both types of Sturmgeschuetz were made available to assault gun battalions. Sturmgeschuetz IV were also used by some of the 3rd battalions within tank regiments.

In the drawing the armoured MG shield for the loader is shown lowered for travelling in the plan and side views. The loader's hatch was used to support this shield and therefore, must be open when it is raised. The schuetzen armour shields are shown with hatched lines on the side view so as not to obscure any details.



ABOVE: A Panzergranadier Sturmgeschuetz Battery equipped with the Sturmgeschuetz IV. The chassis for these guns were from the regular PzKpfw IV Ausf. H production. The superstructure was also from the production for the normal Sturmgeschuetz III. The additional bolted armour plate seen on the left hand side of the superstructure front shows that these Stu. G IV were from the early production of this vehicle, at the beginning of 1944. At this period the Stu. G III had frontal armour of 50 mm plates reinforced with a bolted on 30 mm plate.

THREE TON SPECIAL TRACTOR (FORD 3 TON)

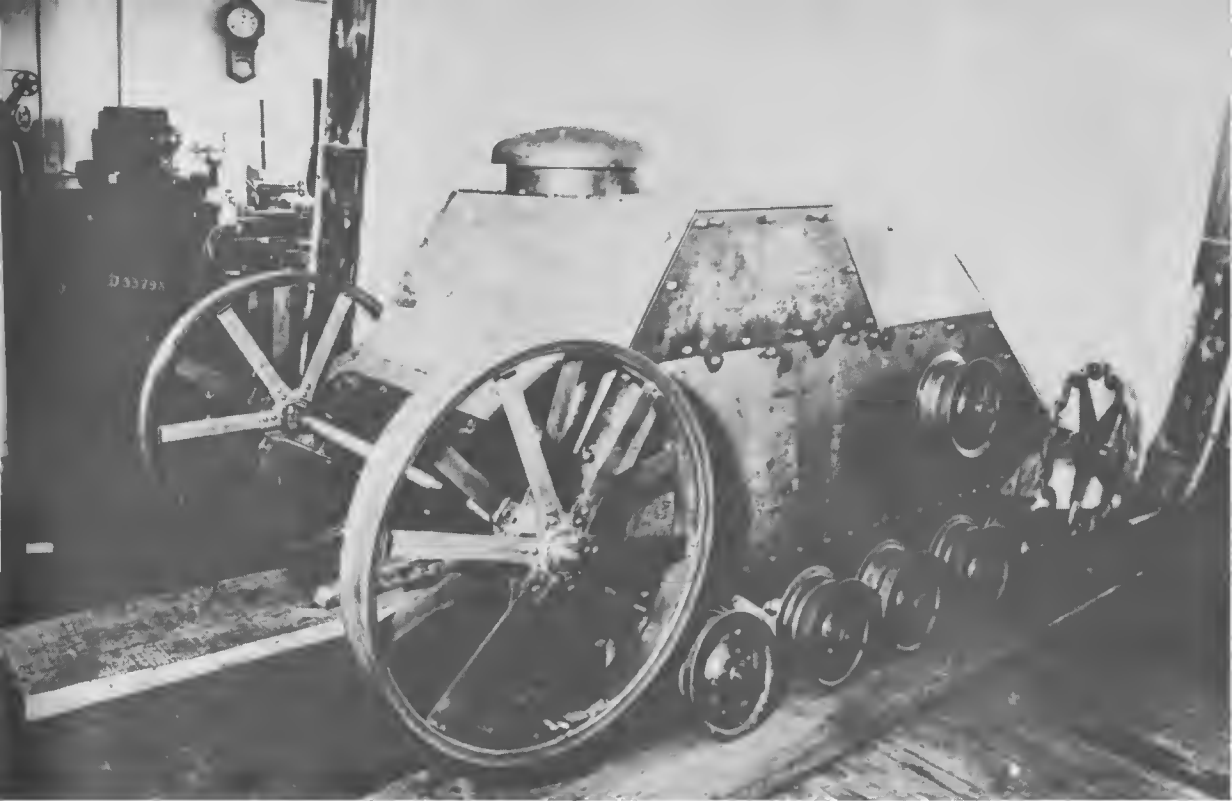
Drawings and historical research by Phil Dyer

Towards the end of the First World War a number of different firms in the United States were producing experimental tanks. In order to take advantage of the large production facilities of the Ford Motor Company at Detroit, a design was evolved for a machine gun or ammunition carrier, for use by the Infantry. It was hoped to turn this vehicle out at the rate of hundreds a day. Although Ford had not been involved in the production of the Six Ton Special Tractor (a copy of the French Renault Char FT 17) the track link design was very similar, as was the large diameter leading idler and rear mounted driving sprocket.

The original mock up had open spoked idlers and driving sprockets with only one return roller each side which was unsprung. On this mock up the guide flanges on the road wheels and idlers were on the outside of the rims, while, on the production vehicles, these track guides were centralised and the idlers and sprockets were made 'solid'. The tank was supported on each side by two bogies, each of three wheels. Each bogie was supported at the end of a semi-elliptic leaf spring which was fixed centrally to the bogie housing.

The problem of powering such a vehicle was overcome in an interesting way. Motive power was supplied by two Ford Model 'T' car engines. These were positioned parallel to each other at the rear of the vehicle. Each of these engines drove one track but interposed between them was an idler gear which meshed with a toothed wheel on each flywheel thus synchronised the power plants. This idler gear was used as a power take-off to run the generator, transmit power from the starter, work the water pump and drive the radiator, all of which were common to the two engines. From the engines power was transmitted through two standard Ford Planetary transmissions with multiple plate clutches via worm drives to the rear sprockets.

The Ford 'T' engines were very unsophisticated with gravity feed from the fuel tank mounted above them, splash lubrication and 'solid' bearings. An idea of the simplicity of these engines is gained from the fact that



ABOVE: *The original mock-up of the Ford three ton special tractor defined the features of the production model. However, very few of the details remained unchanged on the production vehicle. (U.S. Official Photo)*

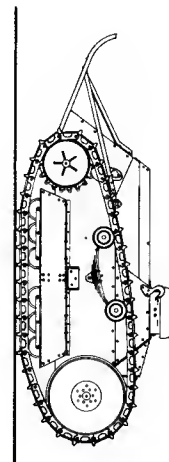
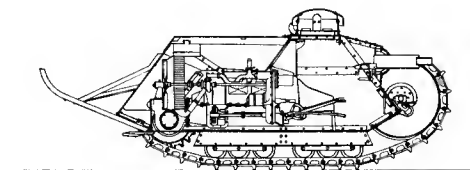
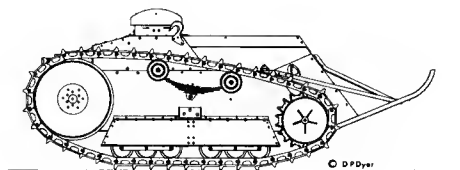
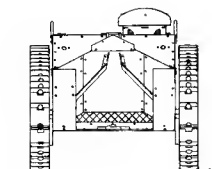
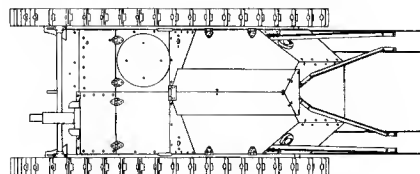
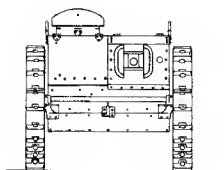
the big ends which had poured babbit bearings could be adjusted for wear by filing away the sides of the bearing caps. The top plates above the engines were all hinged for easy access. Cooling air was drawn up from under the tail plate and after being forced through the radiator was exhausted from underneath each side of the inverted 'vee' shaped armoured cover running longitudinally over the centre of the engine compartment.

The driver and machine gunner sat in front of the engines, the driver on the right and the machine gunner on the left. The driver sat with his head in a mushroom shaped cupola which had six unprotected vision slots for all round vision. This cupola also acted as a ventilation dome. It was hinged and could be folded backwards so the tank could be driven with the driver's head exposed. Entry was gained by the driver through the sloped armoured front which was hinged at the top and could be held open by a stay. This front armour had a locking handle designed so that it could be closed completely or held open varying amounts up to a few inches for ventilation. The machine gunner entered his seat by way of his roof armour plate which was hinged to open forwards. Two pistol ports were provided at the rear of the crew compartment, one each side.

An innovation on the Ford vehicle were the leaf sprung return rollers used to maintain track tension. The method of construction also was advanced for its time. Instead of building a frame of angle irons and brackets and rivetting the armour plates to this, Fords used the armour plates themselves to form the body structure, angle irons and brackets being utilised purely as a means of holding the plates together.

Projecting from the rear and braced to it were two tail skids to facilitate the negotiating of obstacles.

One Ford 3 ton special tractor was sent to France for testing and as a result, orders were placed for 15,000 in October 1918. However, the Armistice was signed the following month and all orders were cancelled so that only 15 were actually completed. Reports stated that the tank was easily handled and had good obstacle climbing ability. The ground pressure was low and it had a good power to weight ratio. Its chief disadvantages were the conditions the crew had to work under, their positions, due to being so close to the engines, were hot, noisy and cramped. Another fault which could have been easily remedied had it gone into production, was the fact that each track could not be adjusted separately. Track adjustment was carried out by moving the idler and both idlers were mounted on a common axle.



THREE TON SPECIAL TRACTOR
(FORD THREE TON)

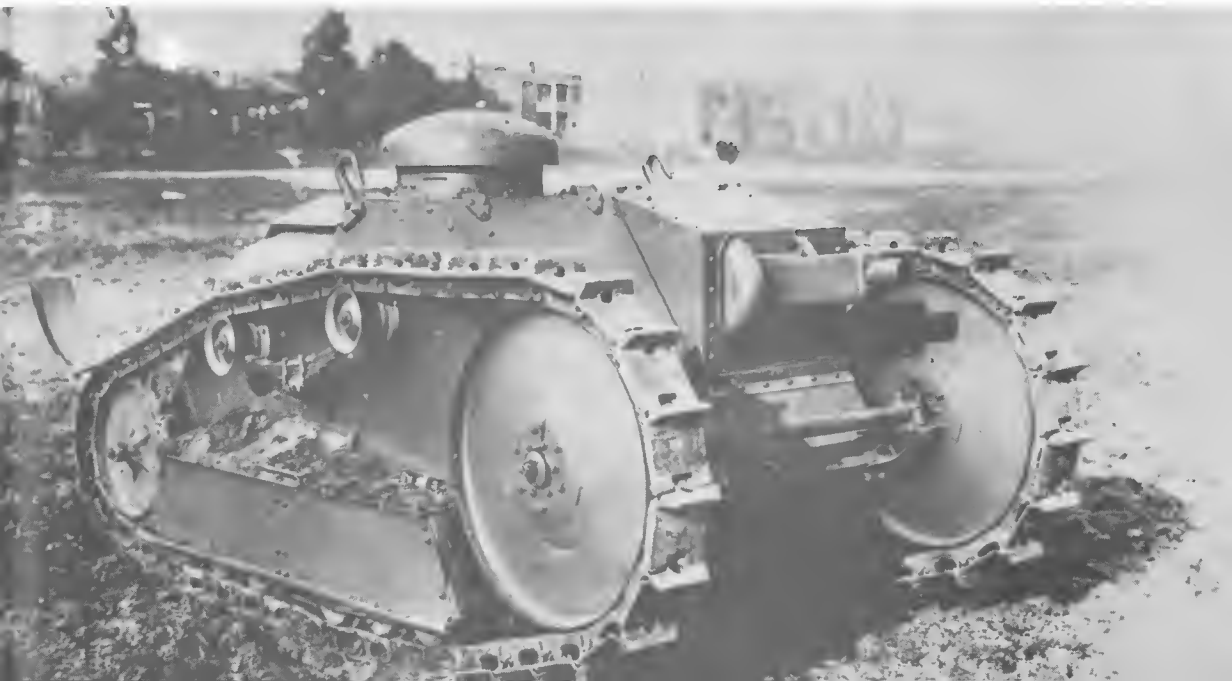


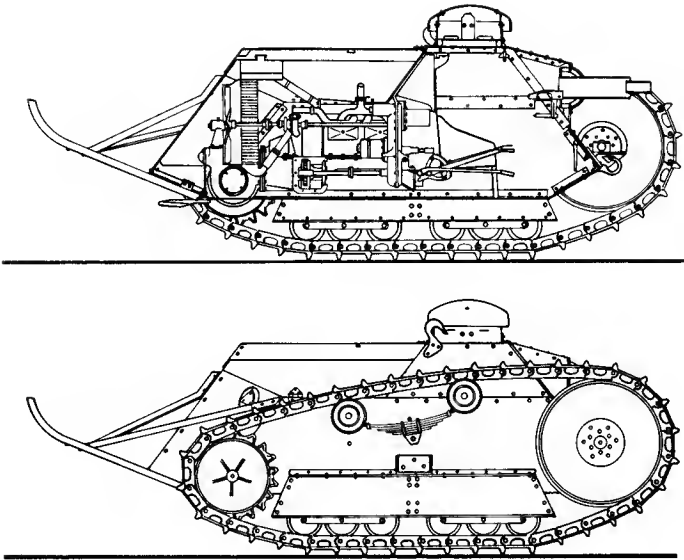
ABOVE: *Rear three quarter view of the Ford three ton special tractor showing the tail skid, common on armoured vehicles of the period, which was designed to increase the trench crossing ability. (U.S. Official Photo)*

These vehicles were also to be used as prime movers for the 75 mm Field Gun and a tow bracket was designed which bolted onto the tail skids.

There are only two known examples still in existence. One of these is stored at Aberdeen Proving Ground, Maryland and the other one is at the Patton Museum, Fort Knox in Kentucky. This latter one was reconstructed in 1964 by volunteers from the Armor School Automotive Department and fitted with a Ford quarter ton truck engine coupled to a G.M.C. steering unit. It was "stated" that with this new power plant the Ford 3 ton Special Tractor was capable of a speed of 20 m.p.h.

BELOW: *A front three quarter view of the Ford tractor. This picture was taken at the Ford Motor Company, Detroit on the 15th October, 1918. (U.S. Official Photo)*





Technical Specification for Three Ton Special Tractor (Ford 3 Ton)

Crew	2	Mechanical Details	
Weight, Combat loaded	6720 lbs. 3 Long tons 3.4 short tons, 3 Tonnes	Engine	2 x Ford Model 'T' 4 cylinders each combined HP 45. Forced water cooling
Performance		Transmission	Planetary — 2 forward, 1 reverse.
Speed, Max. Road	8 mph (13 Kmph)	Steering	Clutch Brake
Max Gradient	25 degrees (47%)	Suspension	2 x 3 wheel pivoted bogies each side. Each bogie at the extreme ends of a semi elliptic leaf spring.
Fording depth	1'—9" (53 cm)	Armament	
Trench crossing	5'—0" (152 cm)	Main	1 x Browning tank machine gun cal.30 Model 1918
Step	1'—8" (50 cm)	Calibre and length in calibres	
Ground pressure	6.4 lbs/sq. ins (.45 Kg/sq. cm)	Traverse	7.62 mm (.30 ins)
Range (internal fuel)		Elevation	21 degrees. Operation: Hand plus 19 degrees, minus 19 degrees
Road	34 miles (55 Km)	Internal fuel capacity	14 Imp. gals. 17 U.S. gals. 63 Litres.
Power to weight ratio	(Net) 14.5 HP/ton	Armour	
Dimensions		Type	Rolled steel plate
Length overall	13'—8" (417 cm)	Hull	Nose upper ¼" (6.1 mm) at 37 degrees
Length (excluding tailpiece)	11'—1" (338 cm)		Nose lower ¼" (6.1 mm) at 60 degrees
Width overall	5'—6" (168 cm)		Gunnery plate ¼" (6.1 mm) at Vertical
Height	5'—3" (160 cm)	Sides	½" (12.7 mm) at Vertical
Ground clearance	1'—3" (38 cm)	Rear, upper	¼" (6.1 mm) at 38 degrees
Fire height of gun	3'—7" (109 cm)	Engine covers	¼" (6.1 mm) at 63 degrees
Road wheel dia	7" (18 cm)	Belly, Front	¼" (6.1 mm) at Horizontal
Trackwork		Rear	¼" (6.1 mm) at Horizontal
Centres	4'—11" (150 cm)	Cupola	¼" (6.1 mm) circular
Length on ground	5'—6" (168 cm)		
Width	8" (20 cm)		
Pitch	7" (18 cm)		
Number of links per track	40		
Type	Single dry pin cast with integral grouser. Chain link type.		